APPENDIX I

"EXPRESS MAIL" Mailing Label Number EI267842785US

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APPENDIX I

Ch cks Done On Renumbered Java Byte Codes

Get the instruction. The numeric value of the instruction implicitly contains the instruction type:

```
insn = getpc(-1);
```

Implement some pre-execution checks based on this:

```
/*
 * Check input stack state. By renumbering the byte codes we can
 * perform the necessary security checks by testing if the value of the
 * byte code (and hence the byte code) belongs to the correct group
 */
  if (insn <= TYPE9_END) {
    if (insn <= TYPE1_END) {
      check_stack_int(1);
    }
    check_stack_int(0);
  }
  else if (insn <= TYPE12_END) {
    check_stack_ref(0);
  }
  else if (insn <= TYPE11_END) {
    push(1)
  }
```

Finally, implement some post execution checks:

```
/*
* Set output stack state.
*/
  if (insn <= TYPE8_END) {
    if (insn <= TYPE6_END) {
      if (insn >= TYPE6_START) {
         pop(1);
       }
       pop(1);
     }
     pop(1);
  }
  else if (insn <= TYPE10_END) {
    set_stack_int(0);
  }
  else if (insn >= TYPE11_START && insn <= TYPE16_END) {
    set_stack_ref(0);
  }
```

Reordering of supported Java byte codes by type

```
/* TYPE 3 */

#define s_POP2          0
#define s_IF_ICMPEQ     1
#define s_IF_ICMPNE     2
#define s_IF_ICMPLT     3
#define s_IF_ICMPGE     4
#define s_IF_ICMPGT     5
#define s_IF_ICMPLE     6
#define s_IF_ACMPEQ     7
#define s_IF_ACMPNE     8

/* TYPE 6 */

#define TYPE6_START     9

#define s_SASTORE       9
#define s_AASTORE       10
#define s_BASTORE       11

#define TYPE6_END       12

/* TYPE 1 */

#define s_IADD          13
#define s_ISUB          14
#define s_IMUL          15
#define s_IDIV          16
#define s_IREM          17
#define s_ISHL          18
#define s_ISHR          19
#define s_IUSHR         20
#define s_IAND          21
#define s_IOR           22
#define s_IXOR          23

#define TYPE1_END       23

/* TYPE 2 */

#define s_ISTORE        24
#define s_POP           25
#define s_IFEQ          26
#define s_IFNE          27
#define s_IFLT          28
#define s_IFGE          29
#define s_IFGT          30
#define s_IFLE          31
#define s_TABLESWITCH   32
#define s_LOOKUPSWITCH  33
#define s_IRETURN       34

/* TYPE 7 */

#define s_SALOAD        35
#define s_AALOAD        36
#define s_BALOAD        37

/* TYPE 9 */

#define s_INEG          39
#define s_INT2BYTE      40
#define s_INT2CHAR      41

#define TYPE9_END       41

/* TYPE 8 */

#define s_ASTORE        42
#define s_ARETURN       43
```

```
#define s_ATHROW        44
#define s_IFNULL        45
#define s_IFNONNULL     46

#define TYPE8_END       46

/* TYPE 12 */

#define s_ARRAYLENGTH   47
#define s_INSTANCEOF    48

#define TYPE12_END      48

/* TYPE 10 */

#define s_SIPUSH        49

#define TYPE10_END      49

/* TYPE 5 */

#define s_ILOAD         50
#define s_ALOAD         51

/* TYPE 11 */

#define TYPE11_START    52

#define s_ACONST_NULL   52
#define s_LDC2          53
#define s_JSR           54
#define s_NEW           55

#define TYPE11_END      55

/* TYPE 16 */

#define s_NEWARRAY      56
#define s_CHECKCAST     57

#define TYPE16_END      57

/* TYPE 13 */

#define s_DUP           58
#define s_DUP_X1        59
#define s_DUP_X2        60
#define s_DUP2          61
#define s_DUP2_X1       62
#define s_DUP2_X2       63
#define s_SWAP          64

/* TYPE 14 */

#define s_INVOKEVIRTUAL     65  /* 01000001 */
#define s_INVOKENONVIRTUAL  66  /* 01000010 */
#define s_INVOKESTATIC      67  /* 01000011 */
#define s_INVOKEINTERFACE   68  /* 01000100 */

/* TYPE 15 */

#define s_GETSTATIC     69
#define s_PUTSTATIC     70
#define s_GETFIELD      71
#define s_PUTFIELD      72

/* TYPE 4 */

#define s_NOP           73
#define s_IINC          74
#define s_GOTO          75
#define s_RET           76
#define s_RETURN        77
```